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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/010,263	12/06/2001	Kazuo Nagatani	FUSA 19.236	5582

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EXAMINER	
BEHULU, ALEMAYEHU	
ART UNIT	**PAPER NUMBER**
2682	

DATE MAILED: 09/23/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/010,263	NAGATANI ET AL.	
	Examiner	Art Unit	
	Alemayehu Behulu	2682	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-19 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

1. Claims 1-3, 6-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Matsuoka (U.S. Patent No. 6,400,774).

Regarding claims 1, 12, Matsuoka discloses distortion compensation method for correcting distortion of a transmission power amplifier in a radio apparatus (figure 5), comprising: storing, in memory, distortion compensation coefficients for correcting distortion of the transmission power amplifier (figure 5, numbers 102, 206, column 29, lines 62-column 30, lines 21); reading a distortion compensation coefficient, which conforms to a present transmit signal and a past transmit signal, out of the memory, and applying distortion compensation processing to the present transmit signal using said distortion compensation coefficient (figure 5, numbers 102, 108, 110, 206, column 29, lines 62-column 30, lines 38); amplifying the transmit signal, to which distortion compensation processing has been applied, by the transmission power amplifier and transmitting the amplified signal (figure 5, numbers 110, 117 column 28, lines 57-column

29, lines 7); and updating said distortion compensation coefficient based upon the transmit signal before distortion compensation and an output signal from the transmission power amplifier (figure 5, number 223, column 30, lines 57-column 31, lines 11).

Regarding claim 2, 13, Matsuoka discloses a distortion compensation method according to claim 1, wherein each distortion compensation coefficient is stored in the memory in correspondence with present and past transmit signals (figure 5, number 206, column 29, lines 62-column 30, lines 38).

Regarding claim 3, Matsuoka discloses a distortion compensation method for correcting distortion of a transmission power amplifier in a radio apparatus (figure 5), comprising: storing, in memory, distortion compensation coefficients for correcting distortion of the transmission power amplifier (figure 5, numbers 102, 206, column 29, lines 62-column 30, lines 21); converting a transmit signal to a quadrature signal composed of an in-phase component and a quadrature component (column 24, lines 17-23); reading a distortion compensation coefficient, which conforms to a present transmit signal and a past transmit, out of the memory in complex form (figure 5, numbers 102, 108, 110, 206, column 27, lines 7-36, column 29, lines 62-column 30, lines 38); applying distortion compensation processing to said quadrature signal by performing complex multiplication between said quadrature signal and said distortion compensation coefficient; applying quadrature modulation to the distortion-compensated quadrature signal (figure 5, numbers 102, 108, 110, 206, column 27- column 28, lines 20), amplifying the quadrature-modulated signal by the transmission power amplifier and

transmitting the amplified signal (figure 5, numbers 112, 113, 117); demodulating an output signal from the transmission power amplifier (figure 5, numbers 117, 219, 221, column 30, lines 39-56); and updating said distortion compensation coefficient by adaptive signal processing using a difference between the quadrature signal before distortion compensation and the demodulated signal (figure 5, number 223, column 30, lines 57-column 31, lines 18).

Regarding claims 6, 14, Matsuoka discloses a distortion compensation method according to claim 1 or 2, comprising one distortion compensation coefficient, which corresponds to a present transmit signal (figure 5, numbers 102, 104, 108,110, refer to arrow line from 104 to 108) and plurality of signal transmitted in the past is read out of the memory and distortion compensation processing is executed (figure 5, numbers 222A/B, 223, 206, 108, 110, refer to arrows entering in to 223 from 222A/B, arrows from 223 to 206, 206 to 108 and from 108 to 110, these are feedbacks form previous signal, column 29, lines 62-column 30, lines 38).

Regarding claims 7, 15, Matsuoka discloses a distortion compensation method according to claim 1 or 2, wherein one distortion compensation coefficient that corresponds to two signals (see Matsuoka figure 5, number 108, 110) , namely a present transmit signal (figure 5, numbers 102, 104, 108, 110, refer to the arrows connecting the numbers maintained here) and a signal transmitted previously, is read out of the memory and distortion (figure 5, numbers 223, 206, 108, 110, refer to the arrows connecting the numbers maintained here).

Regarding claims 8, Matsuoka discloses a distortion compensation method according to claim 7, wherein a distortion compensation coefficient, which corresponds to a combination of a present transmit signal and a difference between the present signal and a signal transmitted previously, is read out of the memory and distortion compensation processing is executed (see Matsuoka column 32, lines 3-11).

Regarding claims 9, 17, Matsuoka discloses a distortion compensation method according to claim 7, wherein a distortion compensation coefficient, which corresponds to a combination of an instantaneous value of a present transmit signal (figure 5, number 1120, refer to the arrow of I/Q signals directly entering 110) and an envelope differential value of the transmit signal, is read out of the memory and distortion compensation processing is executed (figure 5, numbers 104, 206, 110).

Regarding claims 10, 11, 18, 19 Matsuoka discloses a distortion compensation method according to claim 1 or 2, wherein a distortion compensation coefficient, which corresponds to a power value of a present transmit signal and a power value of a signal transmitted in the past, is read out of the memory and distortion compensation processing is executed (column 29, line 52-column 31, lines 18).

Regarding claim 16, Matsuoka discloses a distortion compensation apparatus according to claim 15, further comprising: an arithmetic unit for calculating a difference between a present

signal value and a signal value transmitted previously (figure 7, number 308); wherein the distortion compensation application unit reads a distortion compensation coefficient, which corresponds to a combination of the present transmit signal and the difference between the present signal and the signal transmitted previously (figure 7, numbers 102, 325, 106, 310, 110), out of the memory and executing distortion compensation processing.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 4, 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Matsuoka (U.S. Patent No. 6,400,774) in view of Miyashita (U.S. Patent No. 6,288,610).

Regarding claim 4, Matsuoka discloses a distortion compensation method according to claim 3. However, Matsuoka fails to disclose a distortion compensation coefficient is updated and made to converge to a constant value by adaptive signal processing that uses an LMS algorithm or an RLS algorithm. But, Miyashita discloses a distortion compensation coefficient is updated and made to converge to a constant value by adaptive signal processing that uses an LMS algorithm or an RLS algorithm (column 25, lines 47-55, column 28, lines 65-column 29, lines 61). Therefore, at the time of invention it would have been obvious to a person of ordinary skill in the

art to combine Matsuoka (U.S. Patent No. 6,400,774) with Miyashita (U.S. Patent No. 6,288,610) in order calculate the values of the amplitude distortion correcting function, as suggested by Miyashita

Regarding claim 5, Matsuoka discloses a distortion compensation method for correcting distortion of a transmission power amplifier in a radio apparatus (figure 5), comprising: storing, in memory, distortion compensation coefficients for correcting distortion of the transmission power amplifier (figure 5, numbers 102, 206, column 29, lines 62-column 30, lines 21); converting a transmit signal to a quadrature signal composed of an in-phase component and a quadrature component (column 24, lines 17-23); reading a distortion compensation coefficient, which conforms to a present transmit signal and a past transmit signal, out of the memory in complex form (figure 5, numbers 102, 108, 110, 206, column 27, lines 7-36, column 29, lines 62-column 30, lines 38); applying quadrature modulation to the distortion-compensated quadrature signal, amplifying the quadrature-modulated signal by the transmission power amplifier and transmitting the amplified signal (figure 5, numbers 112, 113, 117); a difference between in-phase components and a difference between quadrature components of the quadrature signal before distortion compensation and of the demodulated signal will become zero (column 32, lines 3-18). However, Matsuoka fails to disclose applying distortion compensation processing to said quadrature signal by adding a real part and an imaginary part of said distortion compensation coefficient to each of the signal components of said quadrature signal (figures 4, 17, column 19, lines 38-column 20, lines 57); eliminating phase rotation, which has been produced by said amplifier, from an output signal of the transmission power amplifier

figure 17 number 22, 93, 94, 2A, 2B, column 15, lines 28-column 16, lines 7, column 34, lines 28-column 35, lines 16, column 35, lines 31-column 36, lines 15) ; demodulating the signal from which said phase rotation has been eliminated; and updating the real part and the imaginary part of said distortion compensation coefficient (figure 17, number 93, column 35, lines 34-46, column 17, lines 32-column 19, lines 30). Therefore, at the time of invention it would have been obvious to a person of ordinary skill in the art to combine Matsuoka (U.S. Patent No. 6,400,774) with Miyashita (U.S. Patent No. 6,288,610) in order to take in to account the phase rotation for better amplifier linearity which adds the benefit of minimizing leakage, as suggested by Miyashita.

Conclusion

3. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Matsuoka et al. (U.S. Patent No. 6,418,173) Transmission Apparatus

Ichiyoushi (U.S. Patent No. 5,699,383) High-Power Linear Amplification Using Periodically Updated Amplitude and Phase Correction Values

NguyenVo
8-20-04

NGUYEN T. VO
PRIMARY EXAMINER